Aviation Maintenance Related Mishaps: Focus on Publications

CDR John Schmidt USN

Naval Safety Center

Norfolk, VA

Technical Manual Maintenance Activity (TMMA) Conference

10 –11 APR 02

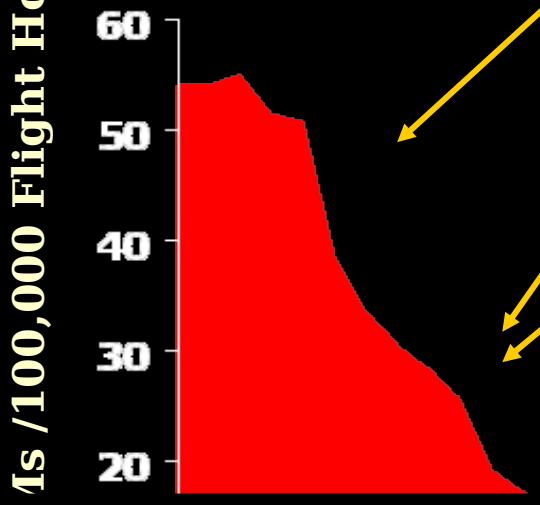
Just plain nuts!

FY 50-01 Naval Aviation Class A Flight Mishap Rates

776 aircraft destroyed in 1950

ENG & ADMIN Controls:

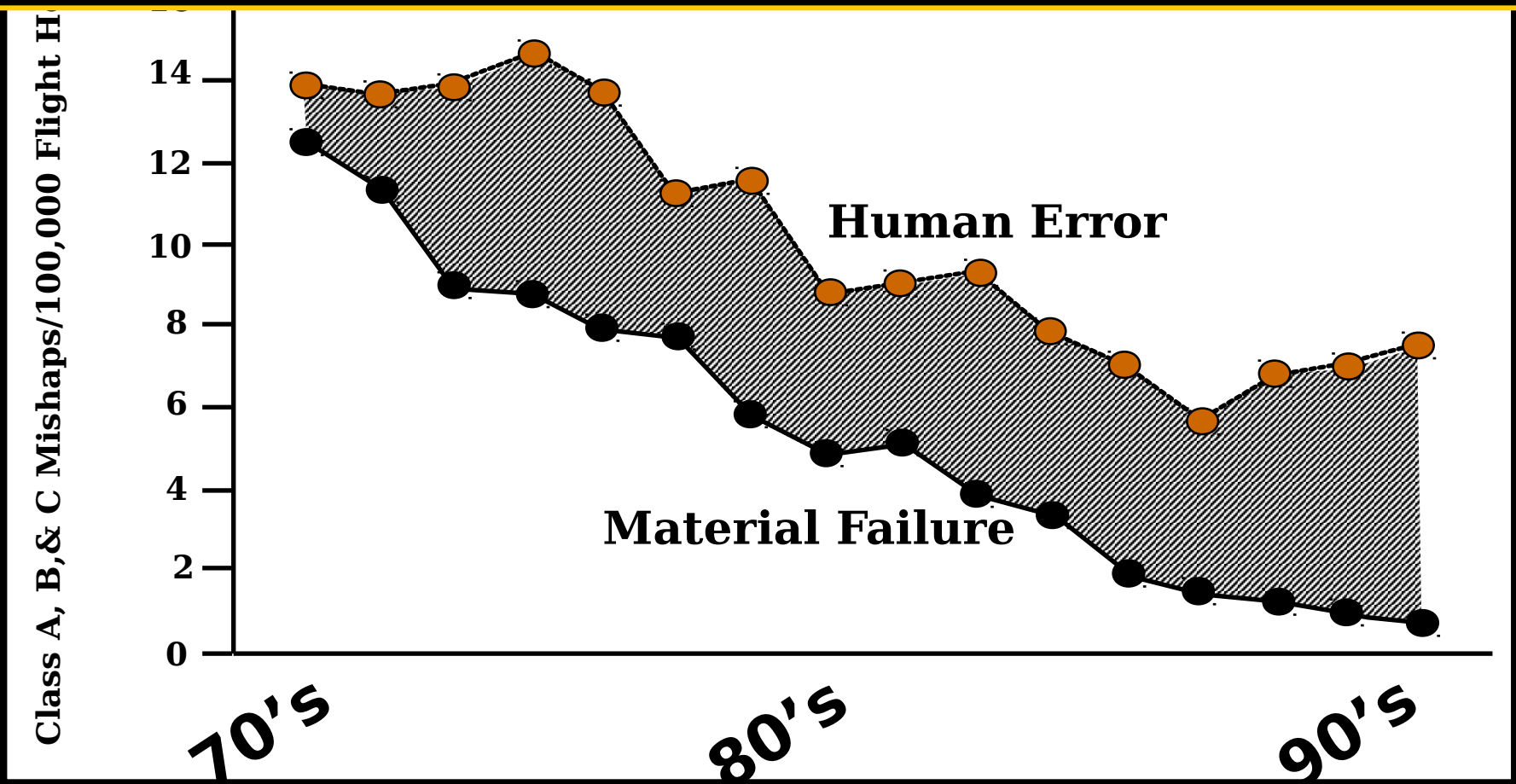
Naval Aviation Safety Center (Now NSC)
Naval Aviation Maintenance Program
Fleet Replacement Squadron Con
NATOPS Program
Squadron Safety Program
System Safety Design
CRM Program
HF Reviews
Climate Surve



Cost of Naval Aviation Misha
the last 5 FYs nearly $3.5 Billion

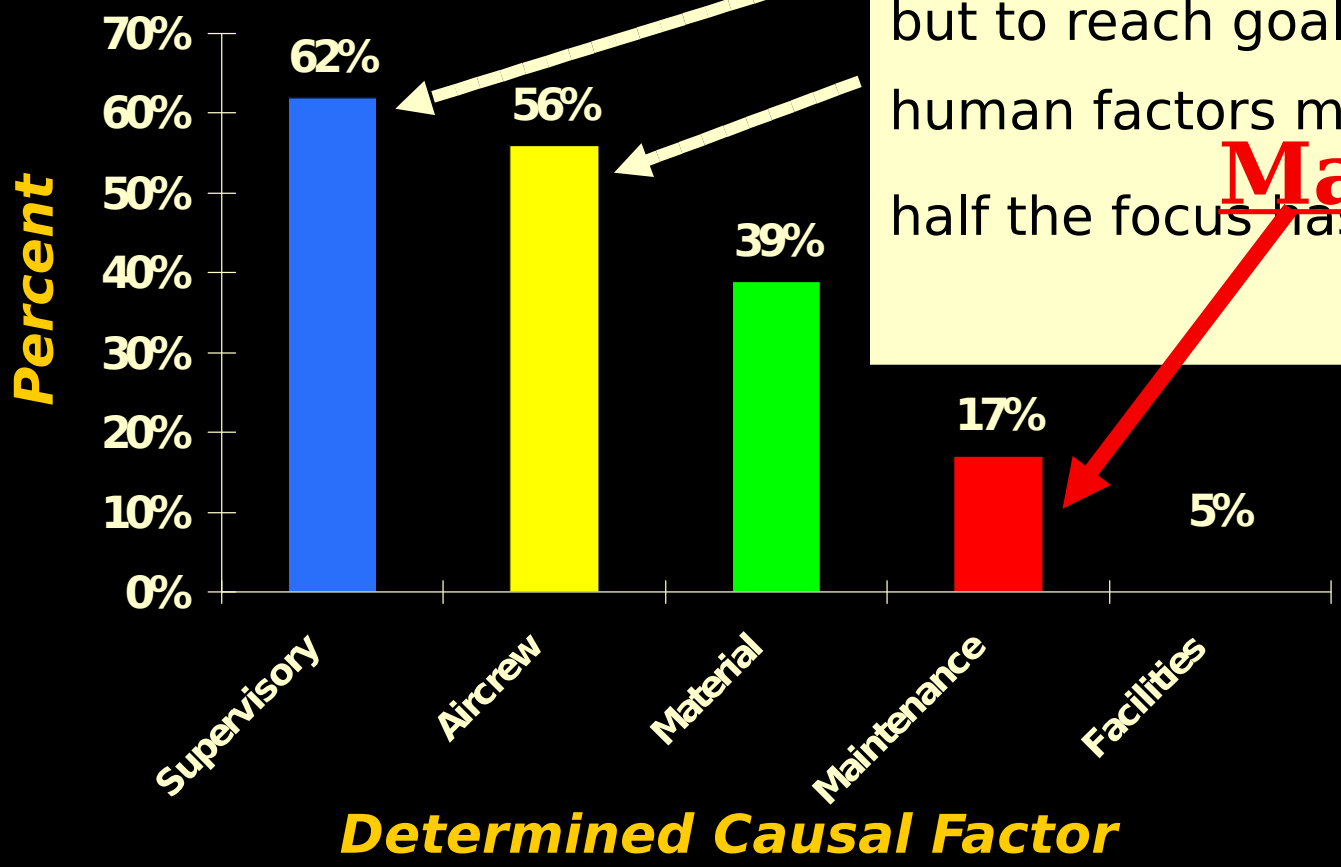
10 aircraft destroyed in 2001

Controls have Impacted Hardware Reliability, but....



Mishap Data Analysis Focus:

Naval Aviation Class A FM Causal Factors

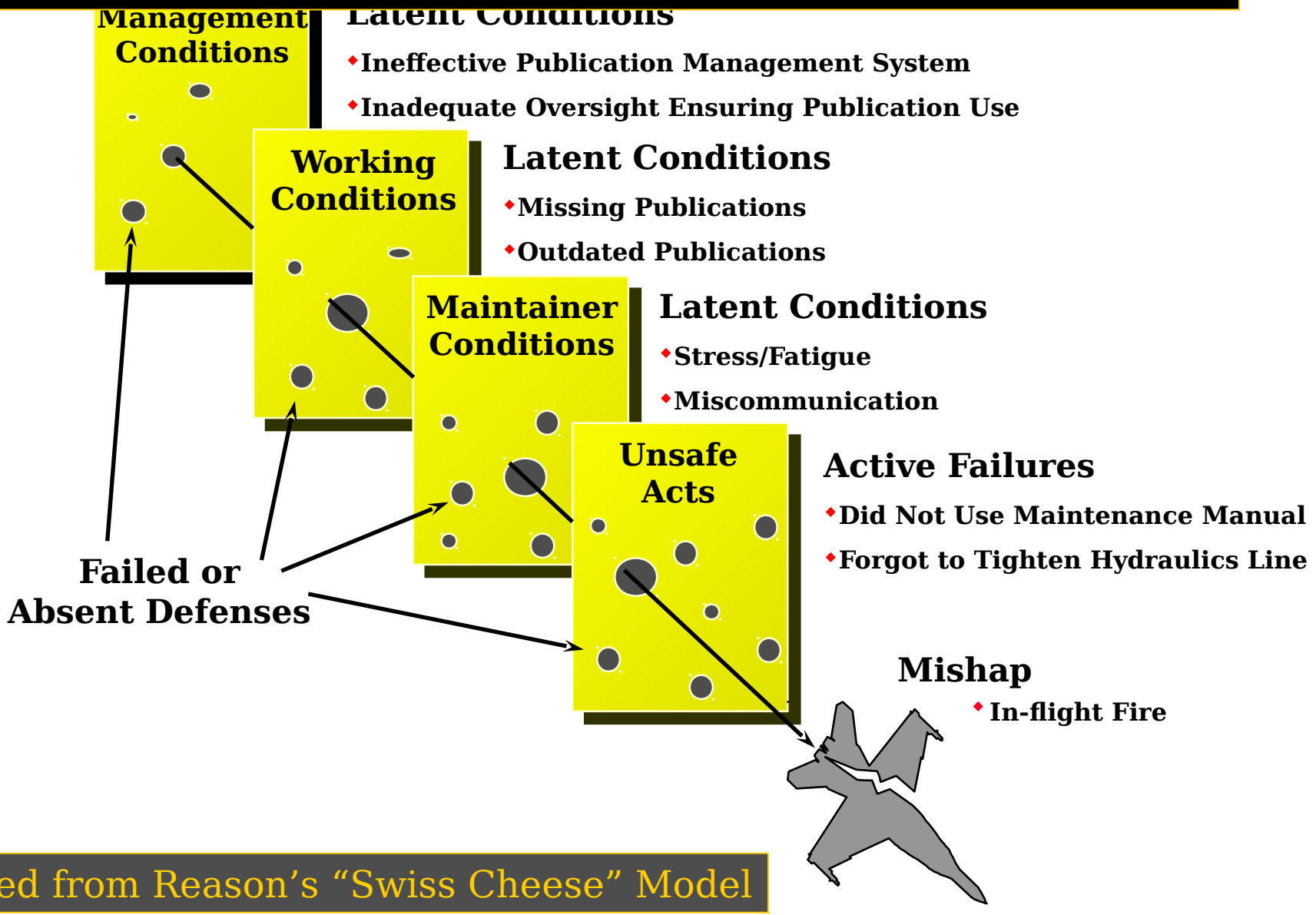


Initial emphasis on "Pilot Error,"

but to reach goal of cutting human factors mishaps in half the focus has turned to:

Maintenance

Human Factors Analysis & Classification System *Maintenance Extension*



e: Adapted from Reason's "Swiss Cheese" Model

HFACS- *Maintenance Extension*

Management Conditions

Working Conditions

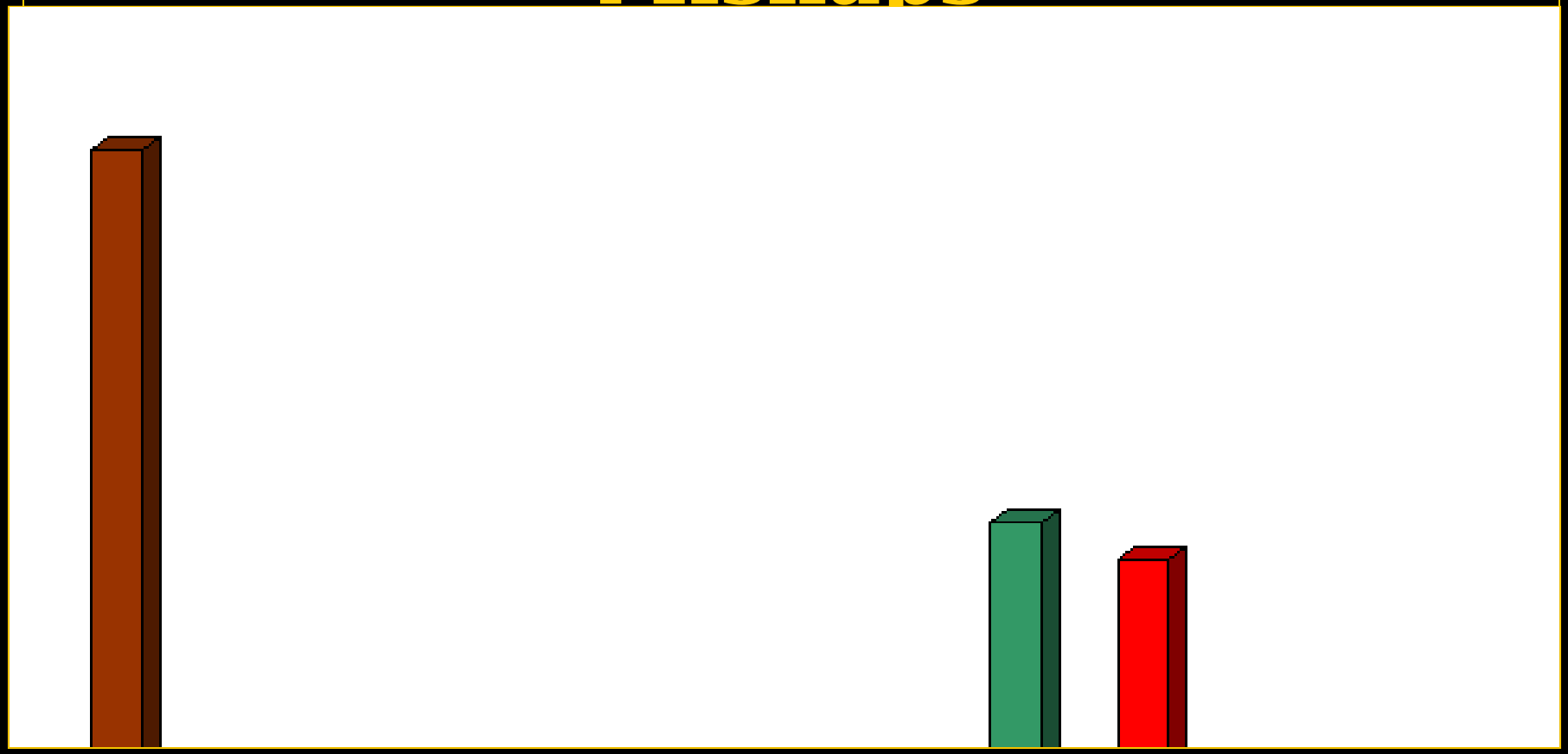
Maintainer Conditions

Maintainer Acts

E6A Illustrated Parts Diagram Deficiency Vs. Aircrew Glove

IPD Wins Hands Down!

Human Error in Mx FY 90-99 Mishaps



- **595 Mx Mishaps Analyzed For Human Errors**
  - Including 72 Class A Mishaps
- **Classified using HFACS-ME by Mx Personnel**
  - Now in OPNAV 3750.6R

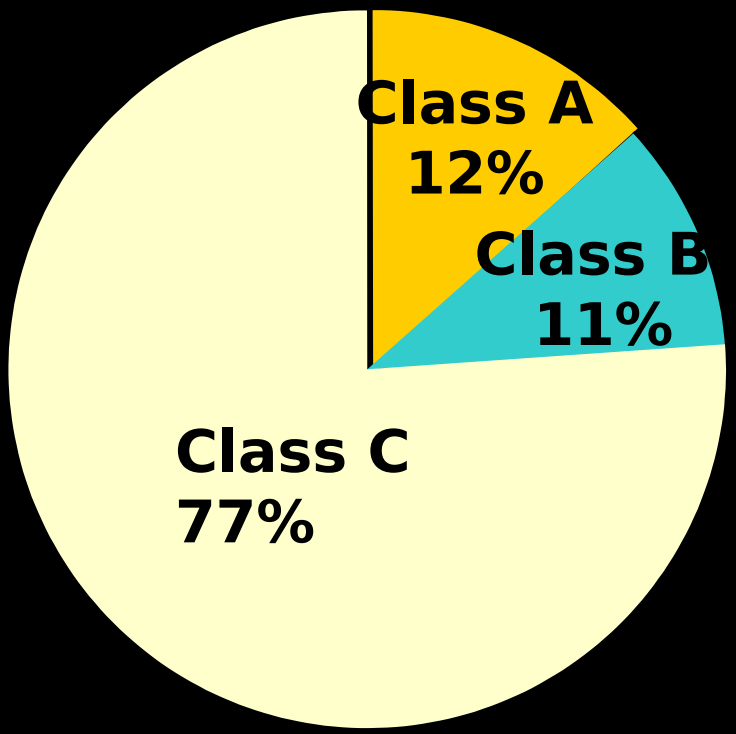
General Findings

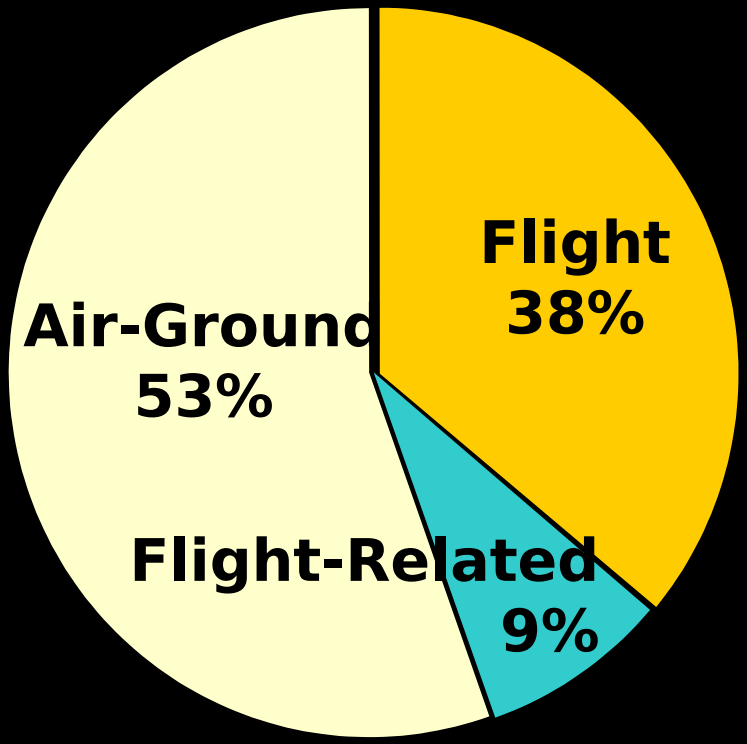
- Poor/non-existent maintenance procedures
- Inadequate/poor supervision of maintenance evolutions
- MISCOMM – SUPV to SUB, pass-down, or shift turnover
- Not using, lack of, or outdated publications
- Violations - not following policy, procedures, checklists, etc.

- Maintenance Activities
- Line/Ramp Activities
- Stores/Ordnance Activities

The Heinrich Ratio

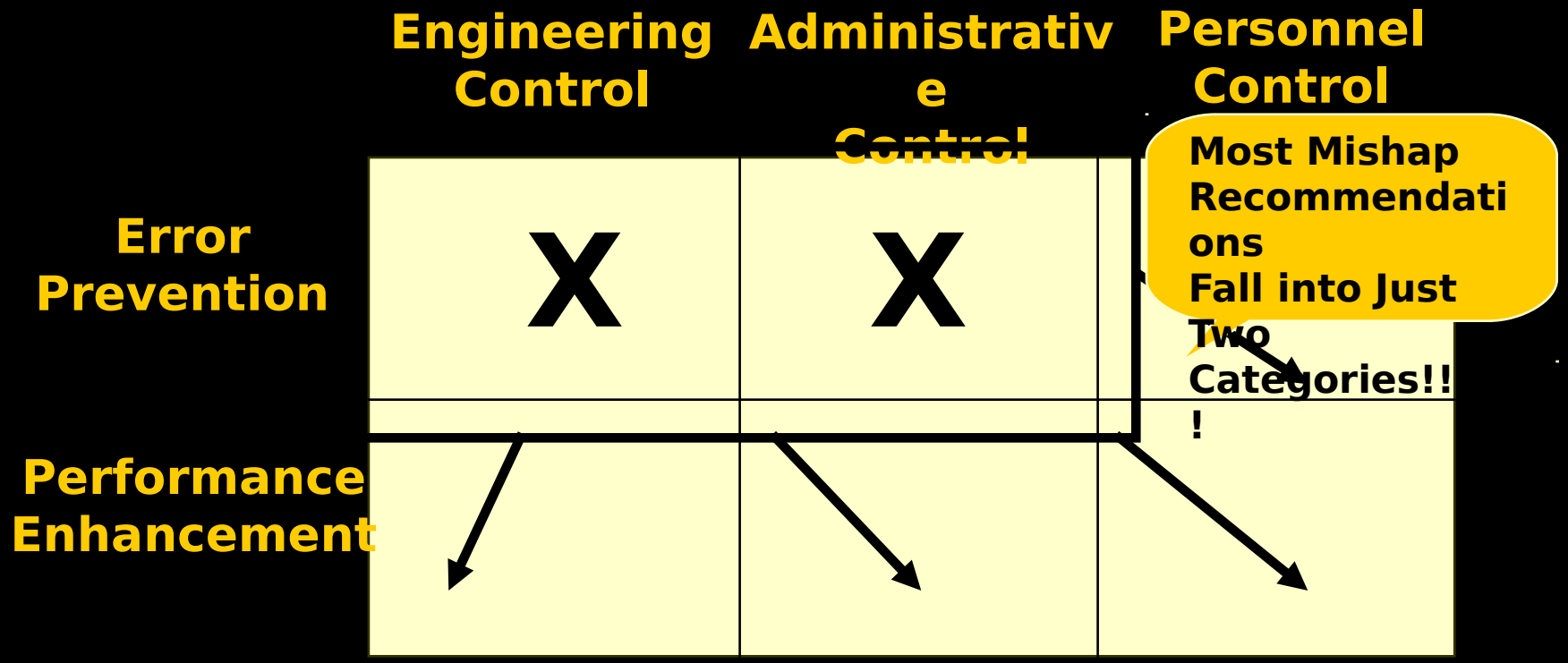
FY90-99 Mx Mishaps by Class & Type (n=595)





Same General Pattern of Issues Observed for Major & Minor Mx Mishaps

Human Factors Intervention Strategy Matrix



"We Need to Start Thinking Out of the Box"

Naval Aviation Publications Issues
&
Their Presence in Maintenance Mishaps

CDR John Schmidt MSC USN

Dr. Bob Figlock (USMC Ret.)

School of Aviation Safety
Naval Postgraduate School Monterey, CA

LCDR Rudy Chavez USN
Naval Air Forces Pacific
NAS North Island, CA

CAPT Mike Hardee USN
Naval Air Systems Command
NAS Patuxent River, MD

Naval Aviation Maintenance Publications

Maintenance Instruction Manuals (MIMs) for aircraft/equipment
are developed using the applicable Naval Maintenance Plan.

Maintenance Plans outline scheduled and/or unscheduled
maintenance on the system and it’s components.

MIMSs are used as source data to assist in developing formal
Maintenance Training Plans (courses)

Naval Aviation Maintenance Publications

<u>Organizational-level MIMs usually contain</u>:

1. Component Description
2. Component Location diagram
3. Physical Characteristics
4. Controls & Indicators Diagram
5. Theory of Operation
6. Signal Flow Diagram & Description*
7. Testing & Troubleshooting

Naval Aviation Maintenance Publications

Limitations/Considerations:

1. Lengthy change time; pen ‘n’ ink changes not authorized.

2. Fleet has limited accessibility to internet based publications.

3. Numerous publication changes vice revisions causes confusion.

4. Some platforms use USAF or Commercial publications not written to fit Naval Maintenance

Naval Aviation Technical Manual Status

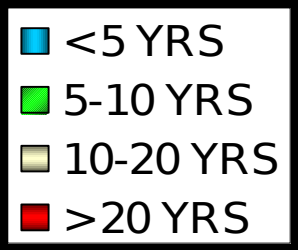
(As of 6/14/00)

Updated within Past 5 Years

Updated more than 20 Years ago

Updated within 5 to 10 Years

Updated within 10 to 20 Years



68% have not been totally revised in 10+

Source: NATEC Master Technical Manual

Technical Publication Deficiency Report (TPDR) & Interim Rapid Action Change (IRAC) STATUS

CAT I TPDR- Deficiencies that may result in death or injury, damage or loss of aircraft, equipment, or facilities.	**CAT I TPDRs** 145
CAT I I TPDR- Routine deficiencies such as part number errors, technical errors, wrong measurement values, etc.	**CAT II TPDRs** 26,507

Source: HFQMB Presentation 06 JUL 00

TOTAL PUBLICATIONS AFFECTED - 1,046

Unincorporated IRAC's **2,475**

20 DEC 01 HFQMB Technical Manual Brief

Provided by CDR Villanueva XO NATEC

- **Outstanding Actions**
  - **2,761 Interim Rapid Action Changes (IRACs)**
  - **18,780 Tech Pub Deficiency Reports (including 218 CAT I)**
  - **5,683 Publications require update**

Long-Term Improvement

- Single focal point for fleet distribution and support processes
- Standardize processes, products, and tools
- Improve quality, quantity, and cycle-time
- Partnership among Fleet, Technical Data, and Programs

Long-Term Improvement Strategic Initiatives

- **IETM Working Group**
  - Working group established in November 2001
  - Navy Safety Center in the loop
  - Purpose: Eliminate/minimize stovepipe implementations
  - Program by Program review of digital implementations
- **IETM Standard Viewer for Naval Aviation**
  - Competitively procure an IETM viewer for Navy
  - Plan approved by PDASN(RDA)

Preliminary HFACS-ME Analysis

- 170 Naval Aviation Maintenance Mishaps Involved a Publications Problem (28%)
  - 96 Involved Process/Procedure Deficiencies (16%), some common examples include:
    - Missing procedural step and/or steps out of sequence
    - Inadequate procedure for inspection, troubleshooting, etc.
    - Procedures do not include hazard and risk warnings
  - 92 Involved Documentation Deficiencies (15%), some common examples include:
    - Technical data is wrong and/or missing (e.g. torque values)
    - Part number, diagrams, etc. are inaccurate and/or missing
    - Inspection criteria inadequate, missing, and/or inaccurate

Cost for FY 90-99 PUBs related Mishaps= $255 M & 1

Preliminary Activity Breakout

- Servicing 09%
- Installation 30%
- Inspection 37%
- Report/Track 06%
- QUAL/CERT 07%
- Line 07%
- Operation 03%
- Miscellaneous 01%

Recommendations

- Ensure publications are updated and enforce their use in maintenance operations
- Provide an effective system to input identified deficiencies and track their resolution
- Provide an effective system to make, disseminate, and notify of publication updates
- Provide an effective system to processes revisions utilizing internet based technology

Questions?